| Notice of Allowability | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/580,223 | KAY ET AL. | |
| | Examiner | Art Unit | |
| | Ayal I Sharon | 2123 | |

***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--***

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *Amendment filed 11/4/04*.

2. ☒ The allowed claim(s) is/are *1-13*.

3. ☒ The drawings filed on *26 May 2000* are accepted by the Examiner.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
      1. ☒ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   **Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER

## EXAMINER'S STATEMENT OF REASONS FOR ALLOWANCE

1. Claims 1-13 are allowed. The following is an examiner's statement of reasons for allowance for the independent claims: claims 1 and 11.
2. The claimed invention pertains to a hardware description language construct that enables synchronized communication between a sender process and multiple receiver processes.
3. The closest relevant prior art used is:
    a. Ashenden, F. et al. "Considerations on System-Level Behavioral and Structural Modeling Extensions to VHDL". Proc. 1998 Int'l Verilog HDL Conference and VHDL Int'l Users Forum. March 16-19, 1998. pp.42-50. (Henceforth referred to as "**Ashenden**").
    b. Hoare, C.A.R. "Communicating Sequential Processes". Communications of the ACM. Vol.21, Issue 8. August 1978. pp.666-677. (Henceforth referred to as "**Hoare**").
    c. Putzke-Roming et al. "A Flexible Message Passing Mechanism for Objective VHDL". Proc. Design, Automation and Test in Europe, 1998. Feb. 1998. pp.242-249. (Henceforth referred to as "**Putzke-Roming**")
4. The Ashenden reference (especially Section 5) discusses in which ways VHDL, a hardware description language, might be extended to address the requirements for system-level behavioral and structural modeling. More specifically, in Section 5.2, the reference teaches implementation of asynchronous and synchronous message-passing communication.

5. In regards to the VHDL implementation of synchronous message passing,

Ashenden teaches the following (see p.46):

> The choice between asynchronous and synchronous message passing is not simple; both forms can be seen in different system-level design languages. ...
>
> Synchronous message passing, on the other hand, is more amenable to formal analysis, and properties such as freedom from deadlock and livelock can be expressed using CSP *[Examiner's note: the Hoare reference],* for example, as the underlying mathematical model. Furthermore, synchronous message passing more accurately reflects the desired behavior of hardware modules that synchronize during communication, for example, using hand-shaking or a common clock without buffering.
>
> Both asynchronous and synchronous message passing can be seen as valid abstractions of communication implemented in hardware and software. Each form can be expressed in terms of the other ... and synchronous communication can be expressed in terms of asynchronous communication using explicit handshaking.

6. Ashenden also teaches a VHDL language construct for the creation of communication channels implementing synchronous message passing on p.47 (left column).

7. However, in regards to the more specific extension of VHDL to enable synchronous message passing between one source and several receivers, (otherwise known as "broadcasting" synchronous message passing) Ashenden only teaches the following (see p.46):

> In considering the third issue, the choice of communication via named channels means that broadcasting amounts to multiple processes receiving from a given channel. This parallels hardware communication, in which a signal from one source can be connected to several receivers. If synchronous communication is used, the presence of multiple receivers implies a barrier beyond which none of the receivers nor the sender can pass until message transmission occurs.

8. Applicant persuasively argues in the amendment filed 11/4/2004:

> *Ashenden et al.* therefore may be describing the desirability of a language construct in which a sender process and a plurality of receiver processes are defined. However, *Ashenden et al.* does not go so far as to describe such a language construct or suggest one in any such way as to enable a person having ordinary skill in the art to arrive at the invention of claims 1 or 11 without their own inventive effort. ... (Amendment, p.5, last para.)
>
> Thus, *Ashenden et al.* serves merely as background information, and only describes the problems involved when multiple processes are received from a given sender (for synchronous communication); i.e., the barrie beyond which none of the receivers or sender can pass. There is no teaching or suggestion in *Ashenden et al.* as to how one having ordinary skill in the art might arrive at the invention as recited in claims 1 and 11. (Amendment, p.6, 2nd para.)

9. In regards to the Putzke-Roming reference, it expressly teaches an object-oriented extenstion to VHDL to enable synchronous message passing (see Abstract and section 3.3.3). However, Putzke-Roming is silent in regards to extending VHDL to enable synchronous message passing between one source and several receivers, (otherwise known as "broadcasting" synchronous message passing).

10. Therefore, neither Ashenden nor Putzke-Roming teach the following limitations of Claim 1:

> said hardware description language incorporating simulation means ... characterised in that the method uses a language construct which, for a given communication, defines a sender process for sending the communication and defines a plurality of receiver processes each for receiving the communication sent by the sender process, thereby effecting synchronised communication between the sender process and the receiver processes.

or the following limitations of Claim 11:

> and comprising a language construct which, for a given communication, defines a sender process for sending the communication and defines a plurality of receiver processes each for receiving the communication sent by the sender process, thereby effecting synchronised communication between the sender process and the recciver processes.

11. Enablement for these limitations can be found in Figs.2 and 3, and pp.23-26 of the specification. Claims 1 and 11 have been interpreted in light of the disclosure.

12. Independent claims 1 and 11, and their dependent claims 2-10 and 12-13 are therefore allowed.

13. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Correspondence Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ayal I. Sharon whose telephone number is (571) 272-3714. The examiner can normally be reached on Monday through Thursday, and the first Friday of a biweek, 8:30 am – 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska can be reached at (571) 272-3716.

Any response to this office action should be faxed to (703) 872-9306 or mailed to:

Director of Patents and Trademarks
Washington, DC 20231

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Tech Center 2100 Receptionist, whose telephone number is (571) 272-2100.

Ayal I. Sharon

Art Unit 2123

February 16, 2005

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER